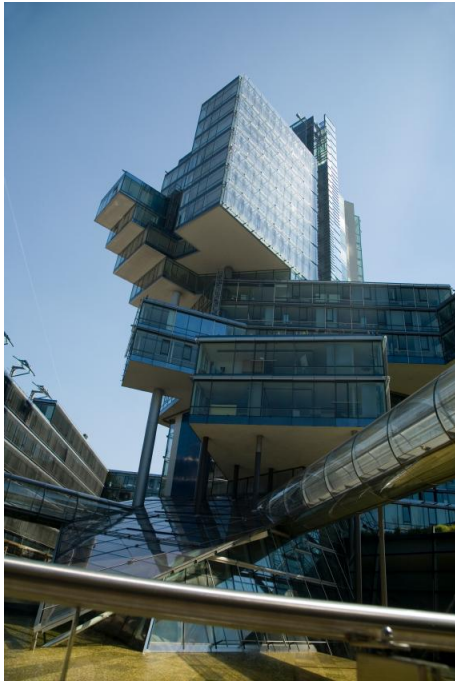


IPENZ ENGINEERING UPDATE February 2011



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Samplings from this Issue

- Are you a good boss – or a great one?
- Leading, learning, and living the Shackleton way: Education and practice.
- How to make the most of your company's strategy.
- Floor vibrations in buildings.
- Integration of water and wastewater utilities.
- Life cycle assessment of buildings: A review.
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- Reinjection in geothermal fields: A review of worldwide experience.

➤ Special Focus : Innovation

Management/Leadership/Strategic Planning/Recruitment/Training and Development/Project Management/Corporate Responsibility

√IPENZ 43/01 **Are you a good boss – or a great one?**

Hill, L. A. and Lineback, K. Harvard Business Review, Volume 89, Issue 1/2 (January/February 2011) Pages 124-131.

Private moments of doubt and fear come even to managers who have spent years on the job. Any number of events can trigger them: an initiative going poorly, a lukewarm performance review, a daunting new assignment. HBS professor Hill and executive Lineback have long studied the question of how managers grow and advance. Their experience brings them to a simple but troubling observation: Most bosses reach a certain level of proficiency and stay there—short of what they could and should be. Why? Because they stop working on themselves. The authors offer what they call the three imperatives for managers who seek to avoid this stagnation.

√IPENZ 43/02 **Best practices for industry-university collaboration.**

Pertuze, J. A. et al. MIT Sloan Management Review, Volume 51, Issue 4 (Summer 2010) Pages 83-90.

The authors believe that implementing the guidelines suggested in this article can result in collaborations that deliver a high level of value. Recommendations include setting out the strategic context of a project when selecting candidates, choosing project managers who can span boundaries and promoting long-term relationships.

√IPENZ 43/03 **The change leadership sustainability demands.**

Lueneburger, C. and Goleman, D. MIT Sloan Management Review, Volume 51, Issue 4 (Summer 2010) Pages 49-55.

The article considers how a business strategy that commercially incorporates sustainability can be implemented by companies. The authors describe three ways in that sustainability differs from other types of corporate initiatives. These are: operational reality, public perceptions and that other corporate undertakings can often be included in a sustainability strategy. To be successful, the initiatives must evolve through three stages.

√IPENZ 43/04 **Disasters, lessons learned, and fantasy documents.**

Birkland, T. A. Journal of Contingencies & Crisis Management, Volume 17, Issue 3 (September 2009) Pages 146-156.

Due to political and organisational barriers that prevent effective learning from disasters, documents concerning 'lessons learned' after a disaster are often 'fantasy documents'. This is because instead of being about the 'real' causes and solutions to disasters, they are produced to show that an authoritative actor has 'done something' in response to the disaster

√**IPENZ 43/05 Engineering leadership and management during financial crisis.**

Gilbert, D. C. and DeVilbiss, C. Leadership & Management in Engineering, Volume 10, Issue 1 (January 2010) Pages 4-9.

Apart from the challenges presented by the financial crisis, its lessons also provide opportunities to create organisations that are more agile, lean, responsive and resilient and thus able to more effectively overcome other troubles. This article begins by outlining causes and immediate actions for the short term that can lessen some financial stress. Then a strategy for leadership and management using the strengths of a learning organisation are laid out.

√**IPENZ 43/06 Globalization: Conundrums and paradoxes for civil engineering.**

Sheehan, M. Leadership & Management in Engineering, Volume 10, Issue 1 (January 2010) Pages 10-15.

Thanks to the interconnectedness of globalisation, when one country falls, all countries fall. Professions such as civil engineering must be aware of the concepts and rationales on which globalisation are based.

√**IPENZ 43/07 Green renewal: incorporating environmental factors in equipment replacement decisions under technological change.**

Sloan, T. W. Journal of Cleaner Production, Volume 19, Issues 2/3 (January/February 2011) Pages 173-186.

Equipment replacement is a fact of life in every industrial setting, and this paper seeks to answer the question: How can firms and policy makers effectively balance environmental and economic concerns with respect to replacement decisions? A replacement model which includes both economic and environmental factors is presented. One must decide whether to keep the existing technology, upgrade to a newer technology which produces a smaller environmental burden, or wait for an even newer, cleaner technology which may be introduced soon. More than 25 000 test problems are solved, examining different objectives and covering a wide range of applications. Including environmental costs does not lead to a consistent increase in the adoption of cleaner technologies; however, including incentives to adopt newer technologies does. When one accounts for the environmental impact of producing new equipment and disposing of old equipment, earlier adoption of new technologies actually increases the total environmental burden in some cases.

√**IPENZ 43/08 How to make the most of your company's strategy.**

Bungay, S. Harvard Business Review, Volume 89, Issue 1/2 (January/February 2011) Pages 132-140.

Corporate strategy often seems abstract to managers on the ground, who struggle to translate it into a realistic plan of action. But a process called strategy briefing, which originated with the military, can help them overcome that challenge. Bungay, the director of the Ashridge Strategic Management Centre, describes in this article how briefings can move managers and their reports from confusion about a complex set of goals and performance measures to clarity about just which objectives each person needs to focus on and in what order.



√IPENZ 43/09 **Leading, learning, and living the Shackleton way: Education and practice.**

Rens, K. L. and Rens, A. J. Leadership & Management in Engineering, Volume 10, Issue 1 (January 2010) Pages 32-40.

Ernest Shackleton displayed leadership skills when confronting extreme hardship. Applying many of his principles can benefit current project management. This article explores Shackleton's leadership traits and presents a case study of how engineering students responded to a Shackleton video. Shackleton's leadership is contrasted with the explorer's Vilhjalmur Stefansson from the same period. Then two engineering case studies from the present day are reviewed demonstrating the complexity and results of leadership where a project manager takes responsibility and does the right thing.

√IPENZ 43/10 **Leading your total life the Peter Drucker way.**

Rosenstein, B. Leader to Leader, Volume 2010, Issue 55 (Winter 2010) Pages 12-17.

Principles and teachings of management consultant Peter Drucker on how balance can be maintained and fulfilment gained during economic recession are presented in this article. For Drucker, success means a multidimensional life with satisfaction and contentment. Future goals, planning second careers and including team for learning and teaching should be included in the design of a diversified life. Drucker points out that living in a multidimensional way results in several advantages, such as a more fulfilling life now, an enhanced sense of purpose and meaning whilst preventing boredom.

√IPENZ 43/11 **Leonardo da Vinci.**

Weingardt, R. G. Leadership & Management in Engineering, Volume 10, Issue 1 (January 2010) Pages 43-48.

An outstanding civil engineer with an all-round education, Leonardo da Vinci is a classic inspiration for scientists, engineers, thinkers and visionaries today.

√IPENZ 43/12 **NeuroLeadership: Sustaining research relevance into the 21st century.**

Lafferty, C. L. and Alford, K. L. SAM Advanced Management Journal, Volume 75, Issue 3 (Summer 2010) Pages 32-40.

The term "NeuroLeadership" combines leadership, management, organisation education and development with the latest neuroscientific knowledge. Advances in functional MRIs may hold the key to comprehending how the mind works. How leaders and followers think can be better understood with input from other psychologists, behavioural scientists, organisational and management theorists.

√IPENZ 43/13 **Public responsibility and private enterprise in developing countries.**

Valente, M. and Crane, A. California Management Review, Volume 52, Issue 3 (Spring 2010) Pages 52-78.

Private firms operating in developing countries may be required to take on public responsibilities, such as education and health care, that usually belong to the public sector. Several face cases of firms who have been confronted with such challenges are cited in this article in addition to discussing the advantages and disadvantages of the four basic strategies that tend to be adopted.

√IPENZ 43/14 **Regulatory pressure and competitive dynamics: Carbon management strategies of UK energy-intensive companies.**

Okereke, C. and Russel, D. California Management Review, Volume 52, Issue 4 (Summer 2010) Pages 100-124.

This article examines how competitive dynamics interacts with regulation when it comes to managing carbon in six large energy-intensive British companies, including Royal-Dutch Shell, British Petroleum, Corus, BHP Billiton, Scottish Power and Centrica. Having the biggest carbon impact means they are the primary targets of government regulation.

√IPENZ 43/15 **Stop holding yourself back.**

Morriss, A., Ely, R. and Frei, F. Harvard Business Review, Volume 89, Issue 1/2 (January/February 2011) Pages 160-163.

After working with hundreds of leaders in a wide variety of organizations and in countries all over the globe, the authors found one very clear pattern: When it comes to meeting their leadership potential, many people unintentionally get in their own way. Five barriers in particular tend to keep promising managers from becoming exceptional leaders.

√IPENZ 43/16 **Stress-test your strategy.**

Simons, R. Harvard Business Review, Volume 88, Issue 11 (November 2010) Pages 92-100.

An economic downturn can quickly expose the shortcomings of your business strategy. But can you identify its weak points in good times as well? And can you focus on those weak points that really matter? Drawing on some 25 years of research, Harvard Business School professor Robert Simons identifies seven questions all executives should ask in order to ensure their strategies' success.

Technical Articles

√IPENZ 43/17 **Behavior of reinforced concrete columns confined by new steel-jacketing method.**

Choi, E. et al. ACI Structural Journal, Volume 107, Issue 6 (November/December 2010) Pages 654-662.

√IPENZ 43/18 **Assessing the recycling potential of industrial wastewater to replace fresh water in concrete mixes: application of polyvinyl acetate resin wastewater.**

Ismail, Z. Z. and Al-Hashmi, E. A. Journal of Cleaner Production, Volume 19, Issues 2/3 (January/February 2011) Pages 197-203.

√IPENZ 43/19 **PCA honors concrete bridges.**

Concrete International (November 2010) Pages 23-27.

√IPENZ 43/20 **Bridge health monitoring system based on vibration measurements.**

Ntotsios, E. et al. Bulletin of Earthquake Engineering, Volume 7, Issue 2 (May 2009) Pages 469-483.



- √IPENZ 43/21 **Control strategies for variable speed pumps in super high-rise building.**
Wang, S. and Ma, Z. ASHRAE Journal, Volume 52, Issue 7 (July 2010) Pages 36-39,42-43.
- √IPENZ 43/22 **Floor vibrations in buildings.**
Longinow, A. and Hannen, W. R. Practice Periodical on Structural Design & Construction, Volume 14, Issue 4 (November 2009) Pages 143-145
- √IPENZ 43/23 **The effect of the building population and the number of floors on the vertical transportation design of low and medium rise buildings.**
Al-Sharif, L. and Seeley, C. Building Services Engineering Research & Technology, Volume 31, Issue 3 (August 2010) Pages 207-220.
- √IPENZ 43/24 **Energy and environmental benefits in public buildings as a result of retrofit actions.**
Ardente, F. et al. Renewable and Sustainable Energy Reviews, Volume 15, Issue 1 (January 2011) Pages 460-470.
- √IPENZ 43/25 **Life cycle assessment of buildings: A review.**
Sharma, A. et al. Renewable and Sustainable Energy Reviews, Volume 15, Issue 1 (January 2011) Pages 871-875.
- √IPENZ 43/26 **Integration of different fire protection/life safety elements into the building design process.**
Megri, A. C. Practice Periodical on Structural Design & Construction, Volume 14, Issue 4 (November 2009) Pages 181-189.
- √IPENZ 43/27 **The effects of future climate change on heating and cooling demands in office buildings in the UK.**
Chow, D. H. C. and Levermore, G. J. Building Services Engineering Research & Technology, Volume 31, Issue 4 (November 2010) Pages 307-323.
- √IPENZ 43/28 **Cracking of concrete buttress dam due to seasonal temperature variation.**
Malm, R. and Ansell, A. ACI Structural Journal, Volume 108, Issue 1 (January/February 2011) Pages 13-22.
- √IPENZ 43/29 **Artificial cooling of the atmosphere—A discussion on the environmental effects**
Marcos Sebastiao de Paula Gomes; Maria Silvia Muylaert de Araujo,
Renewable and Sustainable Energy Reviews, Volume 15, Issue 1 (January 2011) Pages 780-786.
- √IPENZ 43/30 **Combining hybrid cars and synthetic fuels with electricity generation and carbon capture and storage.**
van Vliet, O. et al. Energy Policy, Volume 39, Issue 1 (January 2011) Pages 248-268.

√IPENZ 43/31 **The impact of plug-in hybrid electric vehicles on distribution networks: A review and outlook.**

Green II, R. C., Wang, L. and Alam, M. Renewable and Sustainable Energy Reviews, Volume 15, Issue 1 (January 2011) Pages 544-553.

√IPENZ 43/32 **Distributional effects of a carbon tax on car fuels in France.**

Bureau, B. Energy Economics, Volume 33, Issue 1 (January 2011) Pages 121-130.

√IPENZ 43/33 **A comparative analysis of the value of pure and hybrid electricity storage.**

Sioshansi, R., Denholm, P. and Jenkin, T. Energy Economics, Volume 33, Issue 1 (January 2011) Pages 56-66.

√IPENZ 43/34 **2nd Generation biofuels a sure bet? A life cycle assessment of how things could go wrong**

Melamu, R. and von Blottnitz, H. Journal of Cleaner Production, Volume 19, Issues 2/3 (January/February 2011) Pages 138-144.

√IPENZ 43/35 **Meeting U.S. passenger vehicle fuel economy standards in 2016 and beyond.**

Cheah, L. and Heywood, J. Energy Policy, Volume 39, Issue 1 (January 2011) Pages 454-466.

√IPENZ 43/36 **Establishing a sustainable mining operation: An overview.**

Laurence, D. Journal of Cleaner Production, Volume 19, Issues 2/3 (January/February 2011) Pages 278-284.

√IPENZ 43/37 **Geothermal power production in future electricity markets – A scenario analysis for Germany.**

Purkus, A. and Barth, V. Energy Policy, Volume 39, Issue 1 (January 2011) Pages 349-357.

√IPENZ 43/38 **Integration of water and wastewater utilities.**

Katko, T. S. et al. American Water Works Association, Volume 102, Issue 9 (September 2010) Pages 62-70..

√IPENZ 43/39 **Predicting the effect of soil seasonal change on stress corrosion cracking susceptibility of buried pipelines at high pH.**

Song, F. M. Corrosion, Volume 66, Issue 9 (September 2010) Pages C1-C14.

√IPENZ 43/40 **Reinjection in geothermal fields: A review of worldwide experience.**

Kaya, E., Zarrouk, S. J. and O'Sullivan, M. J. Renewable and Sustainable Energy Reviews, Volume 15, Issue 1 (January 2011) Pages 47-68.

√IPENZ 43/41 **Reliability safety assessment of corroding reinforced concrete structures based on visual inspection information.**

Stewart, M. G. ACI Structural Journal, Volume 107, Issue 6 (November/December 2010) Pages 671-679.

√IPENZ 43/42 **Remote corrosion monitoring systems for highway bridges.**

Agrawal, A. K. et al. Practice Periodical on Structural Design & Construction, Volume 14, Issue 4 (November 2009) Pages 152-158.

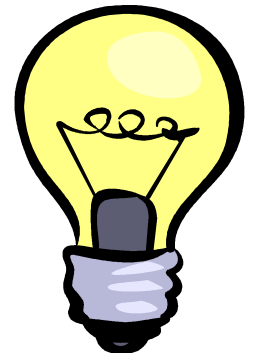
√IPENZ 43/43 **A review on phase change materials integrated in building walls.**

Kuznik, F. et al. Renewable and Sustainable Energy Reviews, Volume 15, Issue 1 (January 2011) Pages 379-391.

√IPENZ 43/44 **Solid-state anaerobic digestion for methane production from organic waste.**

Li, Y., Park, S. Y. and Zhu, J. Renewable and Sustainable Energy Reviews, Volume 15, Issue 1 (January 2011) Pages 821-826.

Special Topic: Innovation



√IPENZ 43/45 **Cleantech innovation: An interview with Peter Grubstein.**

Research Technology Management, Volume 53, Issue 6 (November/December 2010) Pages 41-46.

In this interview with Peter Grubstein, who is executive managing director at NGEN Partners, he talks about NGEN's attempts to move into alternative energy and pollution abatement and some of the software aspects of energy efficiency

√IPENZ 43/46 **Aligning an R&D portfolio with corporate strategy.**

Herfert, H and Arbige, M. Research Technology Management (September/October 2008) Pages 39-

√IPENZ 43/47 **Fiat: Open innovation in a downturn (1993-2003).**

Di Minin, A., Frattini, F. and Piccaluga, A. California Management Review, Volume 52, Issue 3 (Spring 2010) Pages 132-159.

In spite of a business cycle downturn in the 1990s, Fiat developed innovative technologies for engines. This article examines the open innovation paradigm implemented by the CEO. After describing the success of this approach, recommendations on how it could be utilised by other businesses are offered.

√IPENZ 43/48 **Creating value in turbulent times.**

Banholzer, W. Research Technology Management (January / February 2010) Pages 23-28/
The Dow Chemical Company uses several key strategies to manage innovation: including aligning the timing of investments with regard to cash flows, managing fads, company-wide prioritisation, skilled portfolio management and a metrics system to measure real success.

√IPENZ 43/49 **Finding and grooming breakthrough innovators.**

CCohn, J., Katzenbach, J. and Vlaskovits, G. Harvard Business Review, Volume 86, Issue 12 (December 2008) Pages 62-69.

Sustaining innovation, many agree, is crucial for a company's long-term success. But truly innovative people are rare: They have excellent analytic skills, never rest on their laurels, and can identify the solutions likeliest to win over top leadership. They are socially savvy and can bring a diverse group of constituents into alignment. They tend to be both charming and persuasive. The right talent-management procedures can help in spotting potential innovators.

√IPENZ 43/50 **A framework for the assessment of an organisation's innovation excellence.**

Dervitsiotis, K. N. Total Quality Management & Business Excellence, Volume 21, Issue 9 (1 September 2010) Pages 903-918.

√IPENZ 43/51 **How open innovation can help you cope in lean times.**

Chesbrough, H. W. and Garman, A. R. Harvard Business Review, Volume 87, Issue 12 (December 2009) Pages 68-76.

A recession often forces you to cut R&D as you refocus on your core. But innovation need not go by the wayside. By placing certain assets and projects outside your walls, you can actually preserve opportunities for future growth while you shore up the fortress. Chesbrough, of Haas School of Business, and Garman, of New Venture Partners, identify five strategic moves that open the door to innovation by ironically, letting it out of the house. Some inside-out moves permit outside firms to invest in and develop your projects; others call for spinning off projects as separate ventures that still allow you to retain some equity. Whatever the specific approach, you can meet the inherent cultural and organizational challenges of inside-out open innovation by approaching it holistically and placing it under the leadership of senior executives in strategic roles.

√IPENZ 43/52 **How to use an innovation audit as a learning tool: a case study enhancing high involvement innovation.**

Hallgren, E. Creativity and Innovation Management, Volume 18 Issue 1 (2009) Pages 48-58.

√IPENZ 43/53 **The hunt for the elusive concept.**

Oehlers, D. J. Advances in Structural Engineering, Volume 13, Issue 5 (October 2010) Pages 755-772.

When developing new structures or using new materials, structural engineers, be they designers, contractors or academics, are often confronted with introducing innovation into practice using research. This means research is key to introducing innovation and in this paper the author outlines reflections on research approaches and procedures that are frequently applied in structural engineering. The author's research, especially on a generic failure model for reinforced concrete, is used to illustrate the concepts.

√IPENZ 43/54 **Individual resistance to IT innovations.**

Joseph, R. C. Communications of the ACM, Volume 53, Issue 4 (April 2010) Pages 144-146.

√**IPENZ 43/55 Innovation – a business risk that can be managed and migrated .**

Stone, J. Keeping Good Companies (February 2010) Pages 25-30/

It seems that innovation spending is different to many other investments in that there is often more risk, more segments of the firm are involved, there is often some degree of collaboration with outside groups and conventional financial and accounting indicators have trouble with it. Yet in order to foster competitive advantage, it is necessary to manage and mitigate the risk of innovation spending. The case study presented in this paper is GHD's global innovation programme.

√**IPENZ 43/56 The innovator's DNA.**

Dyer, J. H., Gregersen, H. B. and Christensen, C. M. Harvard Business Review, Volume 87, Issue 12 (December 2009) Pages 60-67.

"How do I find innovative people for my organization? And how can I become more innovative myself?" These are questions that stump most senior executives, who know that the ability to innovate is the "secret sauce" of business success. Perhaps for this reason most of us stand in awe of the work of visionary entrepreneurs such as Apple's Steve Jobs, Amazon's Jeff Bezos, eBay's Pierre Omidyar, and P&G's A.G. Lafley. How do these individuals come up with groundbreaking new ideas? In this article, Dyer of Brigham Young University; Gregersen, of Insead; and Christensen, of Harvard Business School, reveal how innovative entrepreneurs differ from typical executives. Their study demonstrates that five "discovery skills" distinguish the most creative executives:

√**IPENZ 43/57 Intrepeneurs and innovation.**

Chui, L. and Curtis, M. B. Strategic Finance, Volume 92, Issue 5 (November 2010) Pages 49-53.

Someone in a large organisation who is pursuing entrepreneurial activities and taking on the associated risk and responsibility for innovative ideas can be called an intrepeneur. This paper looks at intrepeneurship and the use of continuous monitoring (CM) management strategy.

√**IPENZ 43/58 Leading for innovation: Reevaluating leader influences on innovation with regard to innovation type and complexity.**

Friedrich, T. L. et al. International Studies of Management & Organization, Volume 40, Issue 2 (Summer 2010) Pages 6-29.

Innovation is critical to long-term survival and leaders play a key role in supporting innovative attempts at all levels and stages of the creative process. Yet the results of research into the interventions that may be used by leaders are not consistent. This could be due to treating innovation as a single phenomenon instead of multiple constructs. A range of influences on the innovation process by leaders are reviewed in this study and evaluated in terms of various innovation types.

√**IPENZ 43/59 Molecular sieve zeolites: an industrial research success story.**

Flanigen, E. Research Technology Management, Volume 48 Issue 4 (July/August 2005) Pages 29-33.

Many factors, including a commitment by management to foster long-range innovative discovery research when there was no guarantee of commercial success as well as an environment and culture that supported innovation, led to the discovery and development of zeolites and molecular sieves.

√IPENZ 43/60 **Sustainability imperative.**

Lubin, D. A. and Esty, D. C. Harvard Business Review, Volume 88, Issue 5 (May 2010) Pages 42-50. The article discusses the concepts of business megatrends and of sustainability which can limit companies' capacity to create value for consumers. Topics include venture investment in clean technology and sustainability programs, externalities that can affect a business' competitiveness, and the shift in consumers' preferences toward efficiency which led to Total Quality Management. The five areas where companies must excel in sustainability such as leadership, management integration, and communication are discussed. The four stages of value creation are also discussed. The development of management strategies based on information technology innovations is noted.

√IPENZ 43/61 **Towards an integrated framework for managing the process of innovation.**

Tao, L., Probert, D. and Phaal, R. R&D Management, Volume 40, Issue 1 (January 2010) Pages 19-30.

A significant driver for business expansion and success is innovation. However, there are challenges to successful and sustained innovation due to technological uncertainties, unclear market signals and developing competitive structures. This is especially so when it comes to the management of innovation. This paper discusses the Innovation Readiness Levels (IRL) model that can be used to manage the process of incremental innovation.

√IPENZ 43/62 **Twelve innovations that changed our world.**

Nilsson, J. Saturday Evening Post, Volume 281, Issue 5 (1 September 2009) Pages 44-48.

√IPENZ 43/63 **Who captures value in a global innovation network? The case of Apple's iPod.**

Linden, G., Kraemer, K. L. and Dedrick, J. Communications of the ACM, Volume 52, Issue 3 (March 2009) Pages 140-144.

√IPENZ 43/64 **Why innovation matters.**

Brown, B. Research Technology Management, Volume 53, Issue 6 (November/December 2010) Pages 18-23.

Procter & Gamble (P&G) decided to realign its efforts on big, breakthrough innovations that are expected to deliver benefits to consumers and long-term growth over several product generations. However, P&G is confronting challenges such as the prospect of retirement of nearly 50 percent of the US R&D team as well as a focus that is too short-term.

√IPENZ 43/65 **Why sustainability is now the key driver of innovation.**

Nidumolu, R., Prahalad, C. K. and Rangaswami, M. R. Harvard Business Review, Volume 87, Issue 9 (September 2009) Pages 56-64.

When companies pursue sustainability, it's usually to demonstrate that they are socially responsible. They expect that the endeavor will add to their costs, deliver no immediate financial benefits, and quite possibly erode their competitiveness. Meanwhile, policy makers and activists argue that it will take tougher regulations and educated, organized consumers to force businesses to adopt sustainable practices. But, say the authors, the quest for sustainability can unearth a mother lode of organizational and technological innovations that yield both top-line and bottom-line returns. That quest has already begun to transform the competitive landscape, as companies redesign products, technologies, processes, and business models. By equating sustainability with innovation today, enterprises can lay the groundwork that will put them in the lead when the recession ends. Nidumolu,

Prahalad, and Rangaswami have found that companies on the journey to sustainability go through five distinct stages of change: (1) viewing compliance as opportunity; (2) making value chains sustainable; (3) designing sustainable products and services; (4) developing new business models; and (5) creating next-practice platforms. The authors outline the challenges that each stage entails and the capabilities needed to tackle them.

SPECIAL TOPICS IN PREVIOUS IPENZ ENGINEERING UPDATES

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